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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Wit Cezary Bushko et al.	§	
	§	Group Art Unit: 2882
Serial No.: 10/601,715	§	
	§	Examiner: Elizabeth Marie Keaney
Filed: June 23, 2003	§	
For: COLLISION AVOIDANCE SYSTEM AND METHOD	§	Atty. Docket: 121839-1/YOD GERD:0058

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January 30, 2006 Lynda Howell
Date Lynda Howell

APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal mailed on November 22, 2005, and received by the Patent Office on November 28, 2005.

The Commissioner is authorized to charge the requisite fee of $500.00, and any additional fees which may be necessary to advance prosecution of the present application, to Account No. 07-0868, Order No. 121839-1/YOD (GERD:0058).

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1. REAL PARTY IN INTEREST

The real party in interest is General Electric Company, the Assignee of the above-referenced application by virtue of the Assignment to General Electric Company by Wit Cezary Bushko recorded at reel 014228, frame 0083, and recorded June 23, 2003. Accordingly, General Electric Company, as Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

2. RELATED APPEALS AND INTERFERENCES

Appellant are unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellants' legal representative in this Appeal.

3. STATUS OF CLAIMS

Claims 1-11 and 13-33 are currently pending, are currently under final rejection and, thus, are the subject of this Appeal.

4. STATUS OF AMENDMENTS

A formal amendment to claim 6 (to correct dependency) was filed in response to the Final Office Action on August 24, 2005. In the Advisory Action mailed on December 24, 2005,the Examiner indicated that the amendment was not entered. Because the amendment does not require consideration or search, Appellants urge the Board to instruct the Examiner to enter the amendment. The Appendix listing on page 10 includes the amendment made after the final rejection.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates generally to the field of detection systems. *See* Application, page 1, line 5. More particularly, in certain embodiments, the invention relates to a system and method for detecting objects and avoiding collision with system subcomponents.

In many applications, such as imaging systems used in the medical field, detection circuits are used for sensing the presence of objects and avoiding the objects from colliding with sub-components of the imaging system. The objects may vary from patients being imaged to operators operating the system. Another application of such detection circuits is in patient anatomical profiling, where it is necessary to maintain a constant distance between an X-ray detector, for example, and the external anatomical contour of the patient.

For applications such as in X-ray imaging systems, it is desirable to maintain a uniform of electric field around the detector surface. In addition, the sensitivity of the field is generally required to be maintained so as to gauge a well-defined cut-off distance that is dictated when a collision becomes imminent. It is desirable to design a detection system such that the system can detect objects of varying sizes. For example, the detection system should be able to distinguish between small objects at a closer proximity from the detector versus larger objects at a farther proximity.

It is also desirable to ensure that there is no interference between the detection system and the electronics in the X-ray detector. Also, care is generally taken to ensure that the detection system does not reduce the transmissibility of X-rays. Existing systems however do not provide collision detection around the detector and is generally restricted to the edge of the source of the imaging system.

The Application is directed to providing a collision avoidance system to provide the above noted desirable features and also to improve the shortcomings of traditional detection systems.

The Application contains five independent claims, namely, claims 1, 10, 15, 23 and 29 all of which are the subject of this Appeal. The subject matter of these claims is summarized below.

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with claim 1 relates to an imaging system (e.g., 10) for sensing a presence of objects near the imaging system. The imaging system comprises a source (e.g., 12) configured for emitting a stream of radiation, a detector (e.g., 22) configured for detecting a portion of radiation and impacting a detecting face of the detector. The imaging system further comprises a collision avoidance array (e.g., 34) disposed on the detecting face of the detector and configured for sensing objects. *See, e.g.,* Application, at page 4, lines 19-27 and page 5, lines 19-23; *see also* FIG. 1.

With regard to the aspect of the invention set forth in independent claim 10, discussions of the recited features of claim 10 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with claim 10 relates to a collision avoidance system (e.g., 42) for avoiding collision of a system component with an object. The system comprises a collision avoidance array (e.g., 34) disposed on a face of the system component, the collision avoidance array comprising a plurality of plates (e.g., 50) configured to detect a presence of objects and to generate a corresponding electrical signal, wherein the system component is an X-ray detector. The system further comprises a multiplexer (e.g., 36) coupled to the collision avoidance array, the multiplexer configured to selectively activate the plurality of plates, and a sensing circuit (e.g., 38) configured to sense the electrical signal and to generate an output signal representative of the presence of the object. *See, e.g., id.* at page 7, lines 1-15; *see also* FIG. 3.

With regard to the aspect of the invention set forth in independent claim 15, discussions of the recited features of claim 15 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with claim 15 relates a detection system for detecting a presence of an object.

The detection system comprises a plurality of sensors disposed on a substrate (e.g., 82) substantially in a plane, each of the plurality of sensors configured for detecting the presence of the object and generating a corresponding electrical signal, and a plurality of conductors (e.g., 66) extending substantially in the plane and coupled to a corresponding one of the plurality of sensors, each conductor configured to transmit the electrical signal when the object is detected.

With regard to the aspect of the invention set forth in independent claim 23, an embodiment in accordance with claim 23 relates to a method for avoiding collision of a system component with an object. The method comprises detecting a presence of the object within a critical distance from a face of the system component via a collision avoidance array disposed on a detecting face of the system component and generating a corresponding electrical signal and generating an output signal representative of the presence of the object.

With regard to the aspect of the invention set forth in independent claim 29, an embodiment in accordance with claim 29 relates to a system for avoiding collision of a system component with an object. The system comprises means for detecting a presence of the object within a critical distance from a face of the system component via a collision avoidance array disposed on a detecting face of the system component and generating a corresponding electrical signal and means for generating an output signal representative of the presence of the object.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's first ground of rejection in which the Examiner rejected claims 1-5, 7, 9, 10, 12-24, 26, 27, 29, 30, 32, and 33 under 35 U.S.C. § 102 (b) as being anticipated by U.S. Patent No. 5,651,044 (hereinafter, "Klotz").

Second Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's second ground of rejection in which the Examiner rejected claims 6 and 28 under 35 U.S.C. §103(a) as being unpatentable over Klotz in view of U.S. Patent No. 6,412,978 (hereinafter, "Watanabe").

Third Ground of Rejection for Review on Appeal:

Appellant respectfully urges the Board to review and reverse the Examiner's third ground of rejection in which the Examiner rejected claims 8, 11, 25 and 31 under 35 U.S.C. § 103 (a) as being unpatentable over Klotz in view of U.S. Patent No. 6,476,376 (hereinafter, "Beigelsen").

7. ARGUMENT

As discussed in detail below, the Examiner has improperly rejected the pending claims. Further, the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under Sections 102 and 103. Accordingly, Appellants respectfully request full and favorable consideration by the Board, as Appellants strongly believe that claims 1-11 and 13-33 are currently in condition for allowance.

First Ground of Rejection

Claim 1 and the claims depending therefrom

Claim 1 recites an imaging system for sensing a presence of objects near the imaging system. The imaging system includes a source configured for emitting a stream of radiation and a detector configured for detecting a portion of radiation and impacting a detecting face of the detector. The imaging system further includes a collision avoidance array disposed on the detecting face of the detector and configured for sensing objects.

The Examiner based the rejection of claim 1 on a comparison of the collision avoidance array in the present application with a capacitive proximity detection system

disclosed by Klotz. Appellants have carefully reviewed the subject matter disclosed in Klotz and respectfully submit that Klotz does not teach the collision avoidance array recited in claim 1 for at least the reasons summarized below.

The collision avoidance array recited in claim 1 is different from the capacitive proximity detection system disclosed by Klotz. According to claim 1, the collision avoidance array is disposed on the detecting face of the detector and is configured for sensing objects.

Sections (page 4, line 24 through page 5, line 25) in the present application that relate specifically to the subject matter recited in claim 1 describe the claimed arrangement as follows:

> Source 12 is controlled by a power supply/control circuit 24 which furnishes both power and control signals for examination sequences. Moreover, detector 22 is coupled to a detector controller 26 that commands acquisition of the signals generated in the detector. Detector controller 26 may also execute various signal processing and filtration functions, such as for initial adjustment of dynamic ranges, interleaving of digital image data, and so forth. Both power supply/control circuit 24 and detector controller 26 are responsive to signals from a system controller 28. In general, system controller 28 commands operation of the imaging system to execute examination protocols and to process acquired image data. In the present context, system controller 28 also includes signal processing circuitry, typically based upon a general purpose or application-specific digital computer, associated memory circuitry for storing programs and routines executed by the computer, as well as configuration parameters and image data, interface circuits, and so forth.
>
> In the embodiment illustrated in Fig. 1, system controller 28 is linked to at least one output device, such as a display or printer as indicated at reference numeral 30. The output

> device may include standard or special purpose computer monitors and associated processing circuitry. One or more operator workstations 32 may be further linked in the system for outputting system parameters, requesting examinations, viewing images, and so forth. In general, displays, printers, workstations, and similar devices supplied within the system may be local to the data acquisition components, or may be remote from these components, such as elsewhere within an institution or hospital, or in an entirely different location, linked to the image acquisition system via one or more configurable networks, such as the Internet, virtual private networks, and so forth.
>
> Imaging system 10 further comprises collision avoidance system 42 as illustrated in Fig. 2. Collision avoidance system 42 comprises collision avoidance array 34, multiplexer 36, sensing circuit 38 and analysis module 40. In the illustrated embodiment, collision avoidance array 34 is disposed on a radiation detecting face of detector 22. It has been found that the materials used for implementing the collision avoidance array are substantially transparent to x-ray radiation and thus do not interfere with the operation of the other components of the imaging system.

The capacitive proximity detection system disclosed by Klotz is coupled to components of a radiation imaging system so as to sense the position of the radiation detector assembly with respect to a subject and to generate signals to control the movement of the gantry assembly and components thereon to dispose the radiation detector in a desired location with respect to the subject:

> In accordance with this invention, capacitive proximity detection system 200 (FIG. 2) comprises multiplexer 220 that is coupled to capacitive sensing processing unit (or processor) 250, and typically further comprises a shield system 400 coupled to multiplexer 220 and processor 250. Capacitive proximity detection system 200 is coupled to components of radiation imaging system 100 so as to sense the position of radiation detector assembly 125 (FIG. 1)

> with respect to subject 50 and to generate signals to control the movement of gantry assembly 110 and components thereon (such as movable slide 118) to dispose radiation detector 125 in a desired location with respect to subject 50. Klotz, column 3, lines 48-54.

Klotz clearly discloses that the capacitive proximity detection system is disposed *around a collar assembly. See,id.,* FIG. 1 and column 4, lines 1-5. The collar assembly is disposed around the end portion of the detector. As Klotz describes:

> Further, in accordance with this invention, capacitive proximity sensing system 200 comprises *a plurality of sensor plate elements 300 that are disposed around collar assembly 130*, as illustrated in FIGS. 3(A)-3(C), and that are coupled to multiplexer 220 so as to be selectively coupled together in one of a plurality of sensing range modality switching units. Column 4, lines 1-5 (emphasis added).

Further, Klotz discloses that the collar assembly is a "donut-shaped," circular tube type structure:

> A collar assembly 130 is typically disposed around the end or portion of II tube 125 that is closest to the surface of subject 50. Collar assembly 130 is typically donut-shaped, that is, having a circular tube-type structure. Column 3, lines 37-42.

Clearly , the capacitive proximity detection system disclosed by Klotz is not *disposed on the face of the detector.* The detector has a shield system disposed between the detector assembly and the sensor plate elements. *See, id.,* FIG. 2, column 6 and lines 50-57. Klotz describes that:

> In accordance with this invention, proximity sensing system 200 typically further comprises a shield system having a plurality of shielding plate (or guard plate) elements 400 that are disposed in collar assembly 130 (FIG. 3(A) and

> 3(B)). The shield (or guard) plate elements 400 are disposed on a portion of collar assembly 130 that is between the sensor plate elements 300 and radiation detector assembly 125 and movable slide 118 so as to focus the capacitive sensing of sensor plate elements 300 towards imaging region 127 (FIG. 1). Column 6, lines 50-53.

Klotz fails to disclose the capacitive proximity detection system being disposed on the detecting face of the detector assembly. Indeed, the placement to "focus" the sensing towards the imaging region is specifically intended to avoid the need to place the sensors over the detecting face of the imager.

Therefore, Appellants submit that Klotz cannot anticipate claim 1 under 35 U.S.C. §102(b), and respectfully request that the rejection of claim 1 and the claims depending therefrom be reversed.

Claim 10 and the claims depending therefrom

Appellants respectfully submit that in view of the arguments set forth above with regards to independent claim 1, Klotz cannot anticipate the system of claim 10 under 35 U.S.C. §102(b). Specifically, claim 10 recites that the collision avoidance array is disposed on a face of the X-ray detector. As noted above, Klotz does not provide sensor plate elements on a face of the detector assembly described. Therefore, Appellants respectfully submit that independent claim 10 and the claims depending therefrom are allowable.

Claim 15 and Claims Depending Therefrom

Claim 15 recites a detection system that includes a plurality of sensors disposed on a substrate substantially in a plane, each of the plurality of sensors configured for detecting the presence of the object and generating a corresponding electrical signal. The detection system further includes a plurality of conductors extending substantially in the plane and

coupled to a corresponding one of the plurality of sensors, each conductor configured to transmit the electrical signal when the object is detected.

The Examiner based the rejection of claim 15 on a comparison of the detection system in the present application with the capacitive proximity detection system of Klotz. Appellants have again carefully reviewed the subject matter disclosed in Klotz and respectfully submit that Klotz does not teach the collision avoidance array recited in claim 15 for at least the reasons summarized below.

The detection system recited in claim 15 is different from the capacitive proximity detection system disclosed by Klotz. In the present application, the detection system comprises a plurality of sensors disposed on a substrate substantially in a plane.

Sections at page 4, line 24 through page 5, line 25 of the present application relate specifically to the subject matter recited in claim 15:

> Collision avoidance array 34 includes a plurality of plates 50, 52, 54, 56 disposed on the array substantially in a first plane. The array also comprises a plurality of plates 58, 60, 62 and 64 disposed substantially on a second plane. The plates on the first plane together with the plates on the second plane together form an array of capacitors. Each plate configured to sense objects at a corresponding critical distance and configured to generate a corresponding electrical signal. In one embodiment, the capacitor plates are made of aluminum.
>
> Collision avoidance array 34 also comprises a plurality of conductors 66, 68, 70 and 72 extending substantially in the first plane and 74, 76, 78 and 80 extending substantially in the second plane. Each conductor is coupled to a corresponding one of the plurality of plates. For example, conductors 66, 68, 70 and 72 are coupled to plates 50, 52, 54 and 56 respectively. Similarly, conductors 74, 76, 78 and 80 are coupled to plates 58, 60, 62 and 64 respectively.

The sensor plates disclosed by Klotz are disposed so as to be conformal with the curved surface structure of tube like collar assembly:

> In one embodiment of the present invention, sensor plates 300 are disposed so as to be conformal with (that is, conform to the shape of) the curved surface structure 132 of the tube-like collar assembly 130, as illustrated in the cross-sectional view of FIG. 3(A) (that is, cut across one portion of the tube-type structure of the donut-shaped collar assembly). Column 4, lines 53-57.

Klotz further discloses that the sensor plate elements extend circumferentially over a large portion of the collar assembly area:

> Sensor plate elements 300 are disposed around collar assembly in a sensing pattern 305 as illustrated in FIG. 3(C) (a cross-sectional view of one-half of the donut-shaped collar assembly cut along an equatorial plane). The sensing pattern is selected such that sensor plate elements 300 extend circumferentially, typically at equiangular intervals, over a large portion of the collar assembly area so that the proximity detection system can provide long range detection of an object; localization of a subject with respect to a segment on collar assembly 130; and sensitive short range measurement of the position of the subject with respect to the collar assembly. Column 5, lines 8-16.

Thus, the Klotz reference fails to disclose a plurality of sensors disposed on a substrate substantially in a plane. Appellants therefore submit that Klotz cannot anticipate claim 15 under 35 U.S.C. §102(b), and respectfully request that the rejection of claim 15 and the claims depending therefrom be reversed.

Claim 23 and Claims Depending Therefrom

Appellants respectfully submit that claim 23 is patentable for the same reasons summarized above with regards to independent claims 1 and 10. That is, claimed 23 recites that the collision avoidance array is disposed on a detecting face of the recited

component. Klotz does not similarly dispose any detecting sensors on a detecting face of any component (note that the collar of Klotz is not a detecting face). Therefore, Appellants respectfully submit that independent claim 23 and the claims depending therefrom are allowable.

Claim 29 and Claims Depending Therefrom

Appellants respectfully submit that in view of the arguments set forth above with regards to independent claim 1, Klotz cannot anticipate the system of claim 29 under 35 U.S.C. §102(b). Specifically, here again, claim 29 recites that the means for detecting a presence of the object operates "via a collision avoidance array disposed on a detecting face of the system component." Therefore, Appellants respectfully submit that independent claim 29 and the claims depending therefrom are allowable.

Second and Third Grounds of Rejection

Rejections Under 35 U.S.C. §103

Each of claims 6 and 28 dependent directly or indirectly from an allowable base claim. Therefore, Appellants respectfully submit that claims 6 and 28 are allowable in view of such dependency as well as for the subject matter they separately recite. Appellants respectfully request that the Board reverse the rejection of the claims under 35 U.S.C. §103(a).

Each of claims 8, 11, 25 and 31 similarly dependent directly or indirectly from an allowable base claim. Therefore, Appellants respectfully submit that claims 8, 11, 25 and 31 are allowable in view of such dependency as well as for the subject matter they separately recite, and respectfully request that the Board reverse the rejection of the claims under 35 U.S.C. §103(a).

Conclusion

Appellant respectfully submits that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: 1/30/2006

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8. APPENDIX OF CLAIMS ON APPEAL

Listing of Claims:

1. (original) An imaging system for sensing a presence of objects near the imaging system, the imaging system comprising:

a source configured for emitting a stream of radiation;

a detector configured for detecting a portion of radiation and impacting a detecting face of the detector; and

a collision avoidance array disposed on the detecting face of the detector and configured for sensing objects.

2. (original) The system of claim 1, wherein the collision avoidance array includes:

a plurality of plates disposed on the array substantially in a plane to form an array of capacitors, each plate configured to sense objects at a corresponding critical distance and configured to generate a corresponding electrical signal;

a plurality of conductors extending substantially in the plane and coupled to a multiplexer, each conductor being coupled to a corresponding one of the plurality of plates and configured for conducting the electrical signal to a sensing circuit via the multiplexer.

3. (original) The system of claim 2, wherein the multiplexer is configured to selectively couple the plurality of plates to the sensing circuit.

4. (original) The system of claim 3, wherein at least one conductor is coupled to ground to provide shielding for at least one of the plurality of conductors.

5. (original) The system of claim 2, wherein the collision avoidance array further includes at least one shielding conductor extending substantially in the plane and coupled to ground, the shielding conductor configured for providing shielding to at least one of the plurality of conductors.

6. (previously presented) The system of claim 1, wherein the collision avoidance array is further disposed on a non-detecting face of the detector.

7. (original) The system of claim 1, further comprising a motor controlling a motion of a gantry, wherein the motor is configured to stop the motion of the gantry when the object is detected.

8. (original) The system of claim 7, further comprising an analysis module coupled to the sensing circuit, the analysis module configured to determine a size of the object detected by the collision avoidance array.

9. (original) The system of claim 8, wherein the analysis module is configured to determine a distance of the object from the collision avoidance array.

10. (previously presented) A collision avoidance system for avoiding collision of a system component with an object, the system comprising:

a collision avoidance array disposed on a face of the system component, the collision avoidance array comprising a plurality of plates configured to detect a presence of objects and generate a corresponding electrical signal; wherein the system component is an X-ray detector.

a multiplexer coupled to the collision avoidance array, the multiplexer configured to selectively activate the plurality of plates; and

a sensing circuit configured to sense the electrical signal and to generate an output signal representative of the presence of the object.

11. (original) The collision avoidance system of claim 10, further comprising an analysis module coupled to the sensing circuit, the analysis module configured to determine a size of the object detected by the collision avoidance array.

12. (canceled).

13. (previously presented) The system of claim10, wherein the collision avoidance array is disposed on a detecting face of the X-ray detector, the detecting face configured for receiving radiation.

14. (original) The system of claim 10, wherein the collision avoidance array is configured to detect the object within a critical distance from the system component.

15. (original) A detection system for detecting a presence of an object, the detection system comprising:

a plurality of sensors disposed on a substrate substantially in a plane, each of the plurality of sensors configured for detecting the presence of the object and generating a corresponding electrical signal;

a plurality of conductors extending substantially in the plane and coupled to a corresponding one of the plurality of sensors, each conductor configured to transmit the electrical signal when the object is detected.

16. (original) The detection system of claim 15, wherein each of the plurality of sensors is configured for detecting an object at a corresponding critical distance.

17. (original) The detection system of claim 16, wherein the critical distance for each one of the plurality of sensors is determined by a corresponding dimension of the sensor.

18. (original) The detection system of claim 17, wherein the critical distance is a constant for each one of the plurality of sensors.

19. (original) The detection system of claim 15, wherein the substrate comprises an insulator

20. (original) The detection system of claim 15, wherein each of the plurality of sensors comprise a corresponding capacitor sensor.

21. (original) The detection system of claim 15, wherein at least one of the plurality of conductors is coupled to ground to provide shielding for the plurality of conductors.

22. (original) The detection system of claim 21, further comprising at least one shielding conductor to provide shielding for at least one of the plurality of conductors.

23. (previously presented) A method for avoiding collision of a system component with an object, the method comprising:

detecting a presence of the object within a critical distance from a face of the system component via a collision avoidance array disposed on a detecting face of the system component and generating a corresponding electrical signal;

generating an output signal representative of the presence of the object.

24. (original) The method of claim 23, further comprising controlling the system component to prevent collision with the object.

25. (original) The method of claim 23, further comprising determining a size of the object detected.

26. (original) The method of claim 23, wherein the system component is an X-ray detector.

27. (original) The method of claim 26, wherein the detecting comprises detecting from a detecting face of the detector, wherein the detecting face is configured for receiving radiation from an X-ray source.

28. (original) The method of claim 27, further comprising detecting objects from a non-detecting face of the detector.

29. (previously presented) A system for avoiding collision of a system component with an object, the system comprising:

means for detecting a presence of the object within a critical distance from a face of the system component via a collision avoidance array disposed on a detecting face of the system component and generating a corresponding electrical signal;

means for generating an output signal representative of the presence of the object.

30. (original) The system of claim 29, further comprising means for controlling the system component to prevent collision with the object.

31. (original) The system of claim 29, further comprising, means for determining a size of the object detected.

32. (original) The system of claim 29, wherein the system component is an X-ray detector.

33. (original) The system of claim 32, wherein the means for detecting comprises means for detecting from a detecting face of the detector, wherein the detecting face is configured for receiving radiation from an X-ray source.

9. **APPENDIX OF EVIDENCE**

None.

10. **APPENDIX OF RELATED PROCEEDINGS**

None.